Regency® COMMUNICATIONS, INC.

SERVICE MANUAL

VHF POWER AMPLIFIER

MODEL ACH100CD AASCH100CD

1227 S. PATRICK DRIVE
SATELLITE BEACH, FL

0300-4280-300

PRINTED IN U.S.A.
4/82

AASCH100CD/ACH100CD SERVICE MANUAL

SECTION 1 - GENERAL INFORMATION

1-1 DESCRIPTION

The Regency AASCH100CD is a VHF power amplifier in the VHF (132-174 MHz) Communications Band. The AASCH100CD is capable of amplifying an input power level of 5 watts to 100 watts and meets EIA specifications for continuous-duty operation. The amplifier is designed for use with the MICRO COM H06, H09, 19" rack-mount VHF transceivers.

For a flexible and serviceable design, three separate printed boards are incorporated. The IPA/Switch Board (604-308) consists of the RF driver transistor, the pin diode antenna switch, the low-pass filter, and the VSWR detection circuit. The PA Board (700-320) has two RF power transistors and is the final amplifier. The Relay Board contains the DC line filter and the DC power relay.

The ACH100CD amplifier is exactly the same in design and construction less the pin diode antenna switch circuit. This amplifier is to be used for repeater or duplex base station operation only.

1-2 THEORY OF OPERATION

A. INTERMEDIATE POWER AMPLIFIER

The 5 watt RF output from the exciter is fed to the AASCHCD or ACH100CD transmit input connector. C101, C102, and L101 provide proper matching to the base of the intermediate power amplifier Q101, which operates Class C in the frequency range of 132-174 MHz. Q101 produces 20 watts with a DC collector current of 1.8 amperes. The output of Q101 is tuned to 50 ohms by C108 and fed to the power amplifier board.

B. POWER AMPLIFIER

C201 and C202 are tuned to provide proper matching to power amplifiers Q201 and Q202. The parallel configuration of Q201 and Q202 amplify the 20 watts from Q101 to a minimum of 100 watts with a DC collector current of 15 amperes. The output is then tuned to 50 ohms by C224 and fed to the low-pass filter on the IPA Board. Q201 and Q202 also operate Class C with a range of 132-174 MHz.

C. LOW-PASS FILTER

The ACH100CD low-pass filter is comprised of C111, L108, C115, L109, and C116. The AASCH100CD low-pass filter is comprised of those parts mentioned above as well as L107 and C113. This circuit also incorporates printed circuit capacitors as part of the filter. All higher order harmonics are attenuated to at least 64dB above the carrier.

D. ANTENNA SWITCH

The ACH100CD does not have the antenna switch circuitry installed.

On the AASCH100CD the antenna switch is made up by L107, C113, CR102, CR105, and C114. During a non-transmit condition, CR102 and CR105 are "OFF" thereby allowing all signals at the antenna to pass to the receiver. During transmit, CR102 and CR105 are forward biased which places an effective ground on the receive line. C113 is removed from the circuit and L107 appears as a high impedance to the transmitted RF signal providing further isolation of the receiver.

E. VSWR PROTECTION

The output of the low-pass filter is carried through the primary of T101, which is a 50 ohm microstrip, to the antenna. Any mismatch from the antenna will result in a voltage (VSWR) reflected back to T101. This voltage will be coupled to the secondary of T101 and rectified by CR103.

This negative voltage is fed back to the exciter and used to control the amount of drive available from the exciter. A decrease,(more negative), in voltage will decrease exciter drive power thus decreasing amplifier output power, thereby protecting the power transistors from damage due to an open or shorted antenna.

F. RELAY BOARD

The Relay Board consists of the DC power relay and two simple Pi filter circuits which filter the DC line. The relay is divided into two parts; part 1 provides filtered 13.8 VDC to Q201 and the IPA; part 2 provides filtered 13.8 VDC to Q202 and the exciter. This configuration allows equal current draw from each power supply for a cooler, more reliable operation.

No	GENERAL	NOMINAL	GUAR
1	CHANNELS		
2	FREQ RANGE *	132-174 MHZ	
3	OPERATING TEMP	-30°C TO+60°C	
4	OPERATING DUTY CYCLE		
5	SIZE (W-H-D)	19X10X5 1/4 IN. RACK MOUNTED	
6	WEIGHT	9 LBS. 4 OZ.	
7	POWER	13.6 VDC	
	CURRENT DRAIN	@13.6 VDC	
8	RCVR SQUELCH		
9	RCVR MAX. AUDIO		
10	TRANSMIT	17.5 A	
11	ANTENNA	50Ω	
12	CHANNEL SPACING		

No	RECEIVER	NOMINAL	GUAR
	SENSITIVITY		
13	20 DB Q		
14	12 DB SINAD		
	AUDIO SQ SENSITIVITY		
15	THRESHOLD		
16	TIGHT		
17	CTCSS		
18	ADJ CH SEL 20DB		
19	ADJ. CH. DESEN 12DB		
20	OPERATING BANDWIDTH		
21	SPURIOUS & IMAGE		
22	IM 20 DB Q		
23	IM 12 DB SINAD		
24	MAB		
25	FREQ STAB TEMP.		
26	FREQ STAB VOLTAGE		
27	AUDIO RESPONSE		
28	AUDIO OUT PWR (MAX)		

* TYPE ACCEPTANCE UNDER FCC PART 21,90 AND 97 VALID ONLY WHEN THE MICRO COM H06, H09 SERIES TRANSMITTER IS USED AS THE EXCITER

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	RELEASE R-635 RDR. 6-2681	6/29/81	DLF

NO	RECEIVER	NOMINAL	GUAR
29	AUDIO OUT PWR (MAX)		
30	SQ BLOCKING		
31	RCVR ATTACK TIME		
32	RCVR SQ CLOSING		
33	HUM & NOISE RATIO		
34	UNDESIRED CONDUCTED (AC)		
35	UNDESIRED CONDUCTED (RF)		
36	UNDESIRED RADIATED		
37	HIGH HUMIDITY		
38	VIBRATION STAB		
39	SHOCK STAB		
	TRANSMITTER	NOMINAL	GUAR
40	PWR OUTPUT	110W	100W
41	DC PWR IN TO FINAL	180W	
42	OUT FREQ STAB (TEMP)		

NO	TRANSMITTER	NOMINAL	GUAR
43	OUT FREQ STAB (VOLT)		
44	SPUR & HARM CONDUCTED	-70 dB	-64 dB MAX
45	SPUR & HARM RADIATED	-70dB	-64dB MAX
46	OPERATING BANDWIDTH	± 5 MHz	
47	EMISSION		
48	MODULATION		
49	AUDIO FREQ DISTORTION		
50	FM HUM & NOISE		
51	AM HUM & NOISE		
52	AUDIO FREQ RESPONSE		
53	TRANS CARRIER ATTACK		EIA 100 MS MAX
54	SIDEBAND SPECTRUM		
55	HIGH HUMIDITY		
56	VIBRATION STABILITY		
57	SHOCK STABILITY		

AASCH100CD
ACH100CD
AASCH100
ACH100

NEXT ASSY | USED ON

APPLICATION

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE:
FRACT DEC ANGLE
± .XX± ±
.XXX±

MATERIAL

FINISH

DO NOT SCALE DWG

APPROVALS	DATE
DRAWN R.D.R.	6-81
CHECKED	
QPTG SUPV.	
ENGR D.L.F	6/81

Regency COMMUNICATIONS INC.
SATELLITE BEACH, FLORIDA 32937

SPECIFICATIONS
VHF POWER AMPLIFIER

SIZE B | PART NUMBER 304-343 | REV. F

SCALE ____ | SHEET 1 OF 1

SECTION 2 - TEST PROCEDURE - TP-14-392

APPLICATION	
NEXT ASSY	USED ON
	AASCH100/ACH100
	AASCH100CD
	ACH100CD

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	R-637	7/10/81	DLF
B	AC-239	3-26-82	D.A.L.

TEST PROCEDURE
VHF RF POWER AMPLIFIER

I. Test Set-Up (Refer to Figure 1)

1. AASCH100*/ACH100* Power Amplifier
2. VHF Power Generator
3. 50 ohm, 3dB Power Pad, 25 watts or greater
4. Wattmeter VHF 10W element
5. Wattmeter VHF 250W element
6. 50 ohm, 40dB Power Pad, 200 watts or greater
7. VHF Notch Filter
8. Spectrum Analyzer
9. Power Supply 13.6 VDC @ 25A
10. Ammeter 25A
11. AASCH Short Protector/Test Box (Figure 4)
12. Voltmeter 0-15V
13. Voltmeter 0-15V
14. Wattmeter VHF 1W element (not used with ACH100*)
15. 50 ohm Load, 1W or greater (not used with ACH100*)

II. Test Procedure

A. Calibration

1. Connect equipment as shown in Figure 1.
2. Set S1 of short protector (11) to center off position.
3. Adjust RF generator (2) to 5W at 155 MHz on wattmeter (4) when terminated into 50 ohms.
4. Set power supply (9) to 13.6 VDC at input to AASCH100/ACH100 (1) with voltmeter (13).
5. Calibrate power readings on output wattmeter (5).

*Also applies to continuous duty models

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE FRACT ± DEC .XX± .XXX± ANG. ±	APPROVALS	DATE
	DRAWN GM	6/29/81
	CHECKED	
	DFTG. SUPV.	
MATERIAL	ENGR. DLF	7/10/81
FINISH		
DO NOT SCALE DRWG.		

Regency® COMMUNICATIONS INC.
SATELLITE BEACH, FLORIDA 32937

TEST PROCEDURE -
VHF RF POWER AMPLIFIER

SIZE	PART NUMBER	REV.
A	TP-14-392	B

SCALE | SHEET 1 OF 7

B. Short Circuit and LED Test

1. Connect P1 and P2 to AASCH100*/ACH100* amplifier (1).
2. Set S1 of short protector (11) to Position A. The ON and Transmit LED's should light. If D2 (red) on the test box is on, the DC power input is shorted to ground.
3. Switch S1 to Position B; the bypass D3 (green) should be on.

C. Power Output Test (Refer to Figure 2)

1. Connect RF input and output cables as shown in Figure 1.
2. Preset trimmer capacitors C101 and C102 to mid-capacitance.
3. Preset trimmer capacitors C108, C201, and C202 as per the tuning chart (Figure 3).
4. Preset C224 for maximum capacitance.
5. Set S1 on short protector (9) to Position B(bypass).
6. Set wattmeter (4) to read reflected power. Apply RF input power. Tune C101 and C102 for minimum reflected power.
7. Tune C224, C202, C201, and C108 for maximum power on wattmeter (5).
8. Repeat Steps 6 and 7.
9. Adjust C224 for 17.5 amps or less. Power output should exceed 100 watts minimum.
10. To tune for 100 watt maximum power, set power output by tuning C224 toward maximum capacitance from its maximum power position for minimum current.
11. Harmonics as measured on the spectrum analyzer (8), with the notch filter (7) tuned to the carrier frequency should be greater than 64dB down.

D. Receiver Antenna Switch Test (AASCH100*Model Only)

1. Connect wattmeter (14) and 50 ohm load (15) to receiver connector on the amplifier.
2. With amplifier indicating greater than 100 watts output, the maximum power on wattmeter (14) should not exceed 250mw.

E. SWR Circuit Test

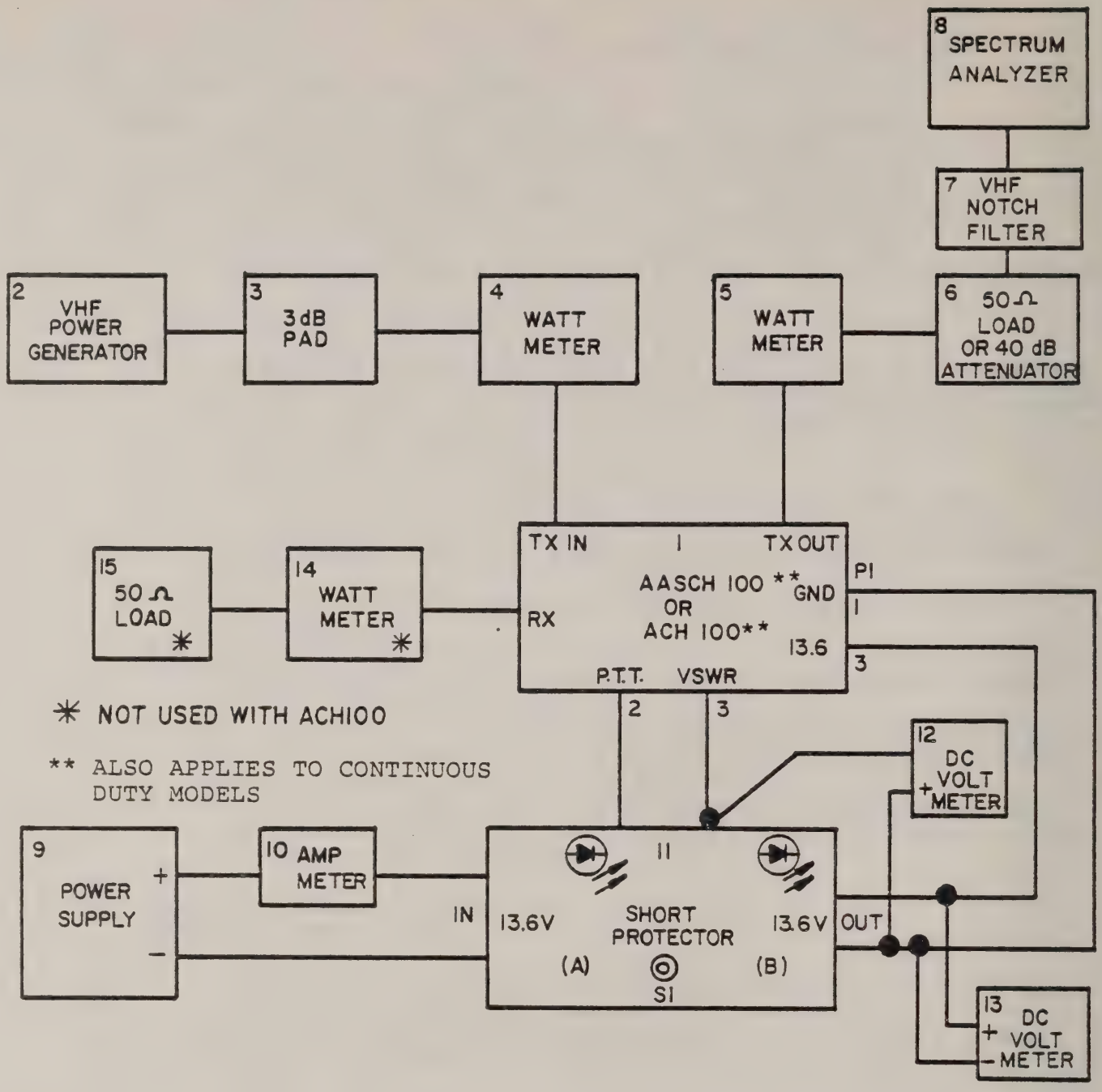
1. With 100 watts power output the voltmeter (12) should read - 1.1 VDC
2. Pull coax connector off at wattmeter (5). Voltmeter (12) should read - 2.25 VDC

*Also applies to continuous duty models

F. Table of Performance Limits

PARAMETER	MIN	TYP	MAX	UNIT
RF Power Out	100	110		W
DC Current	15.5	17.5	18.5	A
VSWR (normal)		-1.1		VDC
VSWR (cable pulled)		-2.25	-2.5	VDC

DRAWN	GM	DATE 6/29/81	SIZE A	PART NUMBER TP-14-392	REV B
APPROVED	DLF	DATE 7/10/81			
DO NOT SCALE DWG.			SCALE		SHT 3



TEST INTERCONNECTION DIAGRAM

FIGURE 1

DRAWN R.D.R	DATE 6-29-81	SIZE A	PART NUMBER TP-14-392	REV.
APPROVED DLF	DATE 7/10/81			
DO NOT SCALE DWG.		SCALE ~		SHEET 4

DO NOT SCALE DWG.

APPROVED DLF

DRAWN R.D.R. DATE 6.29.81

DATE 7/10/81

SCALE ~

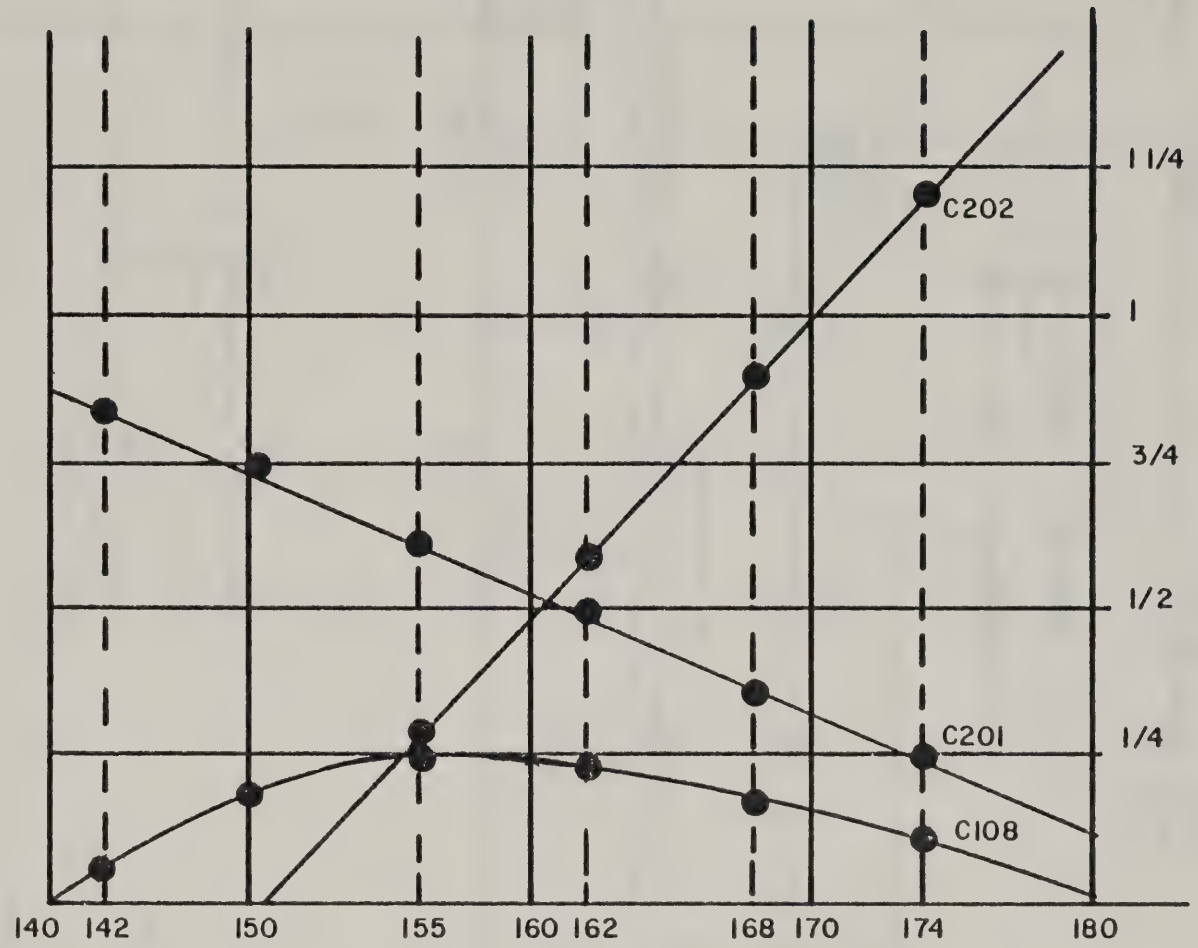
SIZE A

PART NUMBER TP.14.392

SHEET 5

REV. B

FIGURE 3



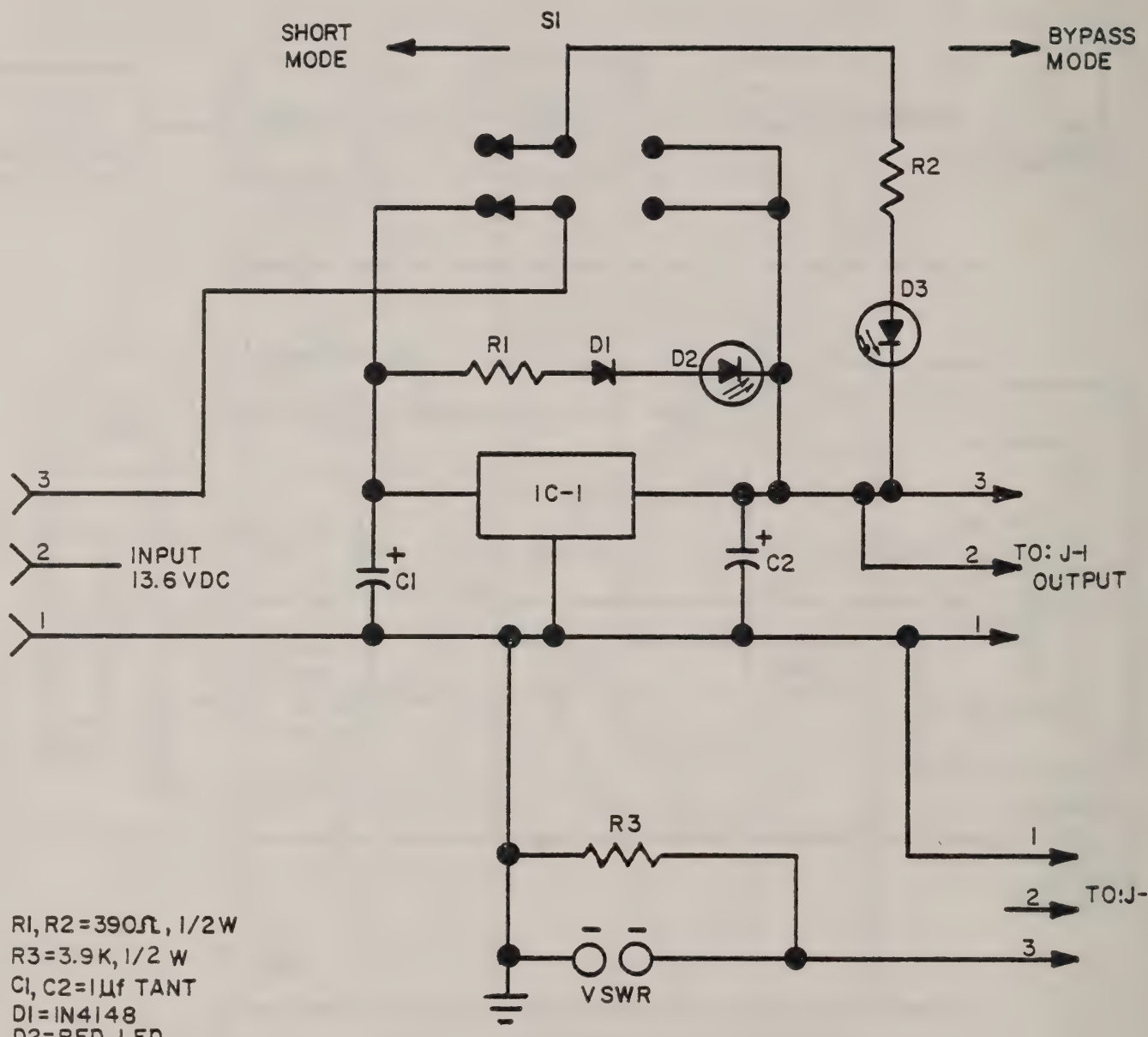
AASCH 100*/ACH 100*

TUNING CHART

(IN TURNS CCW FROM RIGHT)

*Also applies to continuous duty models

FIGURE 4



R1, R2 = 390Ω, 1/2W
R3 = 3.9K, 1/2 W
C1, C2 = 1μf TANT
D1 = IN4148
D2 = RED LED
D3 = GREEN LED
IC-1 = 7812 REGULATOR
S1 = D.P.D.T.
J-1 = RED & BLACK

AASCH SHORT PROTECTOR / TEST BOX
SCHEMATIC

DRAWN R.D.R		DATE 6-29-81	SIZE A	PART NUMBER TP-14-392	REV. B
APPROVED DLF		DATE 7/10/81			
DO NOT SCALE DWG.			SCALE ~		SHEET 6

DWG NO. TP-14-392 SH. 6 REV B

DO NOT SCALE DWG.

DRAWN R.D.R. 6-29-81

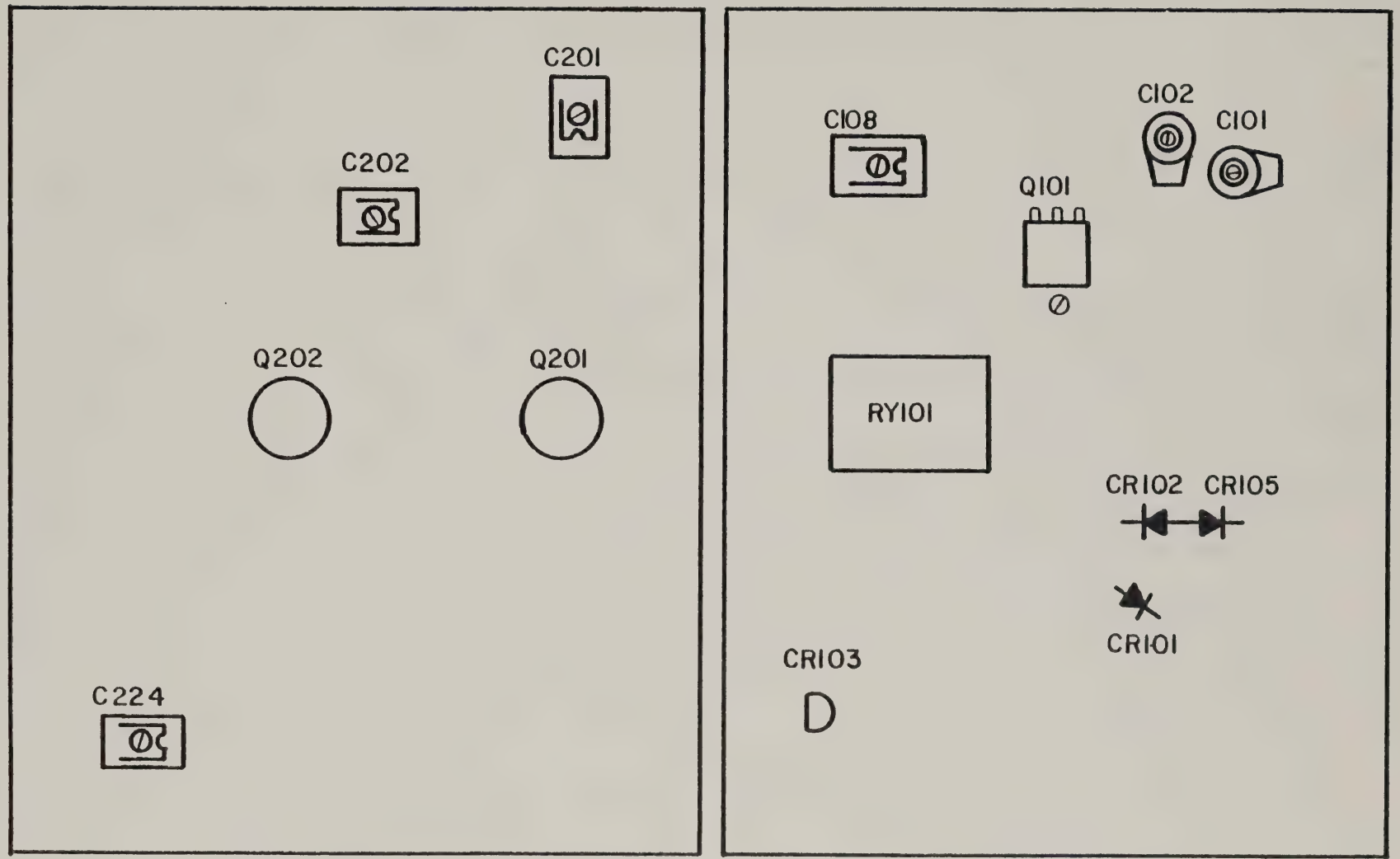
APPROVED D.L.F. DATE 7/10/81

SCALE ~ SIZE A

PART NUMBER TP-14-392

SHEET 7 REV.

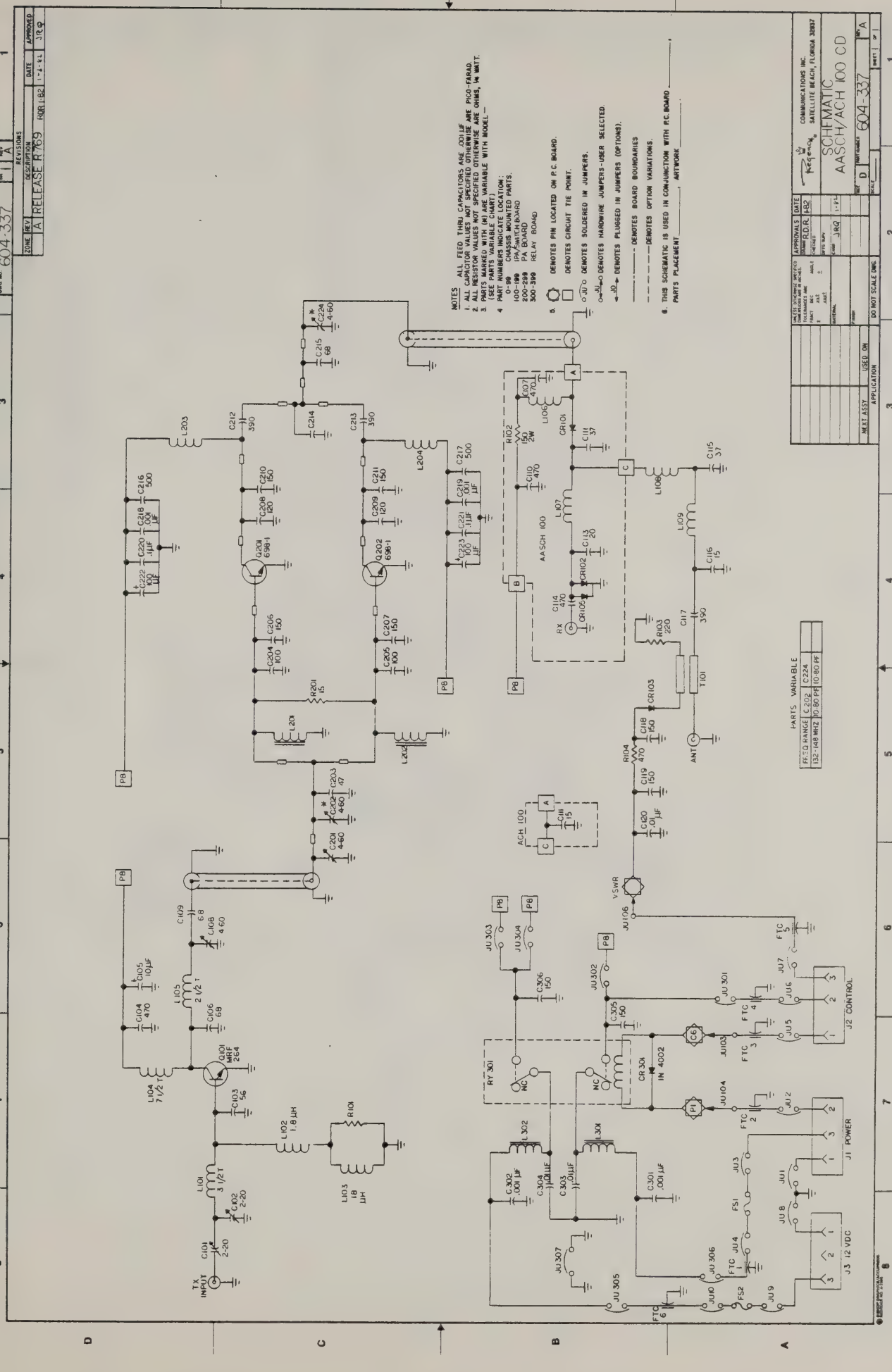
FIGURE 2

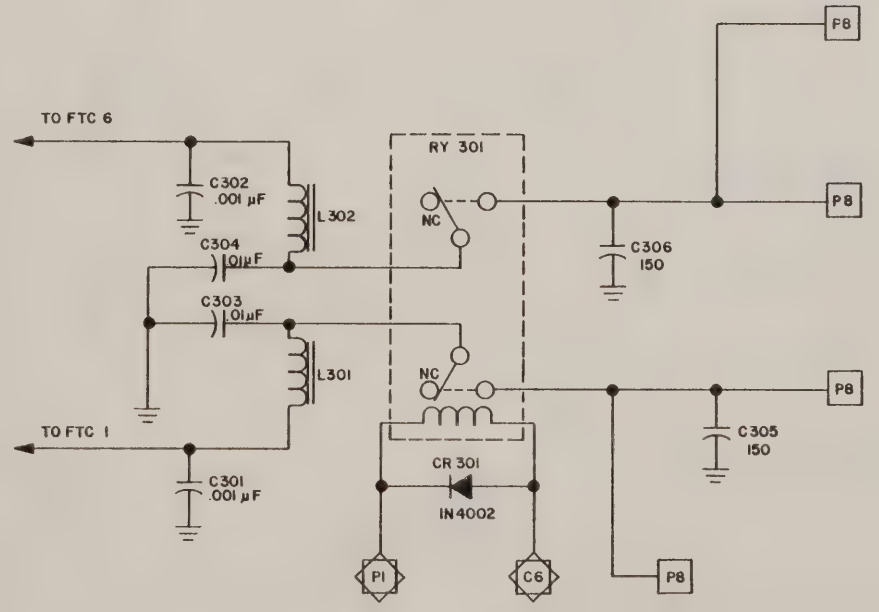


AASCH100*/ACH100*
TUNING ADJUSTMENTS LOCATIONS

*Also applies to continuous duty models.

SECTION 3 - SERVICE INFORMATION


SCHEMATIC
AASCH/ACH 100 CD
604-337
COMMUNICATIONS INC.
SATELLITE BEACH, FLORIDA 32937
NOTES
1. ALL FEED THRU CAPACITORS ARE .001µF
2. ALL CAPACITOR VALUES ARE SPECIFIED IN PICO-FARAD.
3. ALL RESISTOR VALUES NOT SPECIFIED OTHERWISE ARE OHMS, ¼ WATT.
4. PARTS MARKED WITH (#) ARE VARIABLE WITH MODEL — (SEE PARTS VARIABLE CHART)
PART NUMBERS INDICATE LOCATION:
0-99 CHASSIS MOUNTED PARTS.
100-199 ACH-100 PA BOARD
200-299 AASCH-100 PA BOARD
300-399 RELAY BOARD
5. DENOTES PIN LOCATED ON P.C. BOARD.
DENOTES CIRCUIT TIE POINT.
DENOTES SOLDERED IN JUMPERS.
DENOTES HARDWIRE JUMPERS-USER SELECTED
DENOTES PLUGGED IN JUMPERS (OPTIONS).
——·——·—DENOTES BOARD BOUNDARIES
— — — —DENOTES OPTION VARIATIONS.
6. THIS SCHEMATIC IS USED IN CONJUNCTION WITH P.C. BOARD _____, PARTS PLACEMENT _____, ARTWORK _____.
PARTS VARIABLE
FREQ RANGE C202 C224
132-148 MHZ 10-80 PF 10-80 PF
AASCH 100
ACH 100
J1 POWER
J2 CONTROL
J3 12 VDC
TX INPUT
ANT
RX
VSWR
RY 301
CR 301
IN 4002
Q101 MRF 264
Q201 2N6981
Q202 2N6981



NOTES.

1. ALL CAPACITOR VALUES NOT SPECIFIED OTHERWISE ARE PICO-FARAD.
2. ⬡ DENOTES PIN LOCATED ON P.C. BOARD.
   □ DENOTES CIRCUIT TIE POINT.
3. THIS SCHEMATIC IS USED IN CONJUNCTION WITH P.C.BOARD 504-620, PARTS PLACEMENT 504-618, ARTWORK 504-621.

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
	A	RELEASE R-759 RDR 12-1-81	12-18-81	JRQ

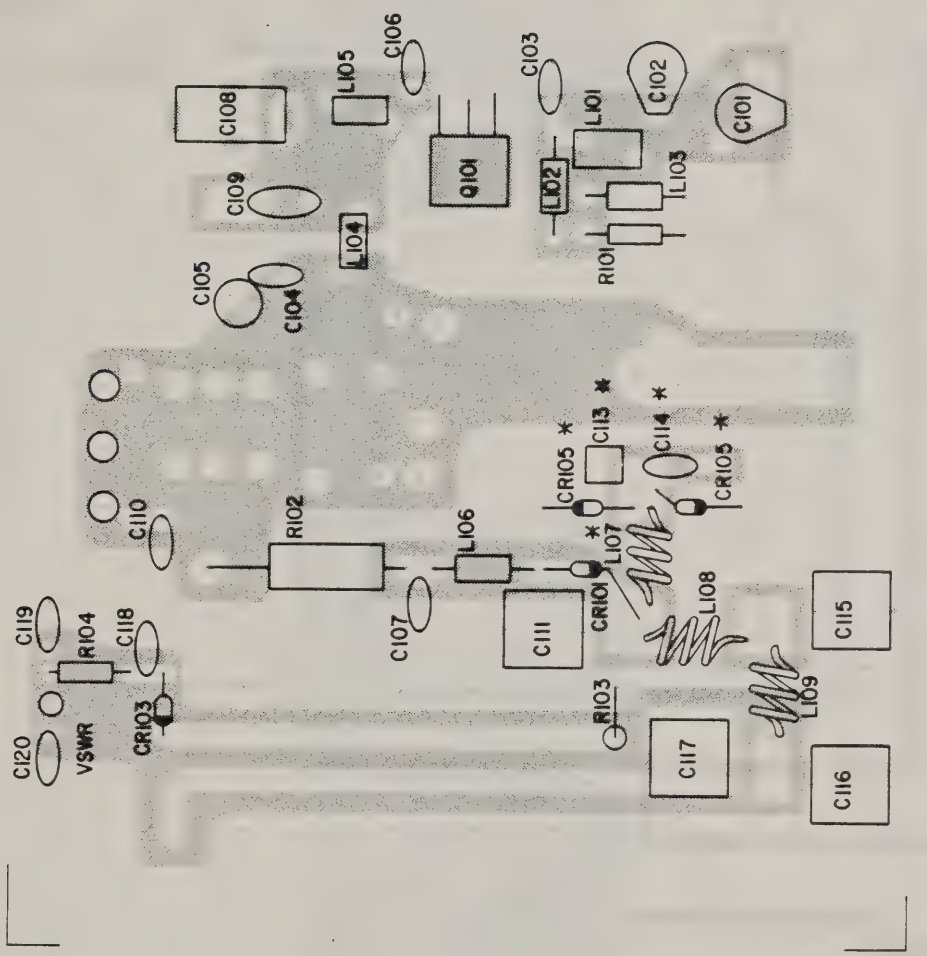
DWG. NO. 504-617 SH 1 REV. A

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE. FRACT. ± DEC. .xx± .xxx± ANGLE ±	APPROVALS	DATE	Regency COMMUNICATIONS INC. SATELLITE BEACH, FLORIDA 32937
			DRAWN R.D.R.	12-81	AASCH/ACH 100 CD RELAY BOARD SCHEMATIC
			CHECKED		
			QFTG. SUPV.		
		MATERIAL	ENGR. JRQ	12-81	
	AASCH/ACH 100	FINISH			SIZE C PART NUMBER 504-617 REV A
NEXT ASSY	USED ON				SCALE SHEET OF
APPLICATION		DO NOT SCALE DWG.			

3-3 IPA SWITCH BOARD PARTS PLACEMENT

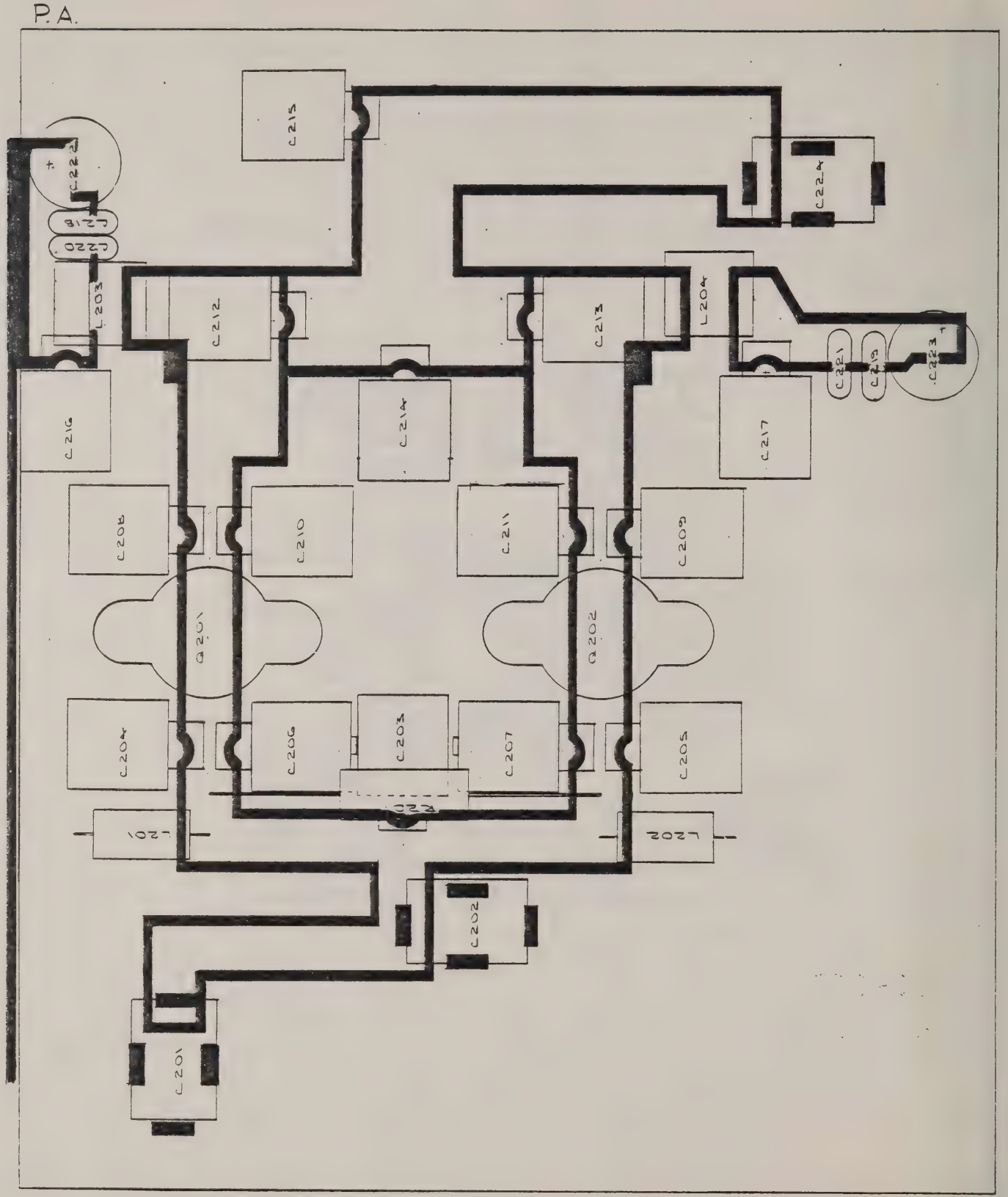
AASCH 100 CD

604-308

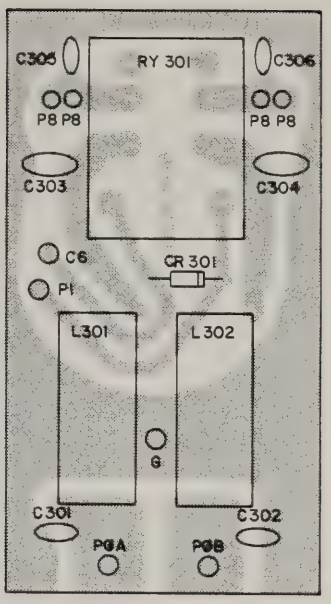


604-338 A

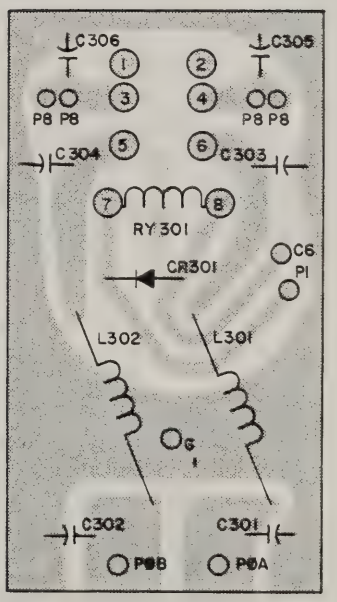
* AASCH100CD ONLY



3-4 - PA BOARD PARTS PLACEMENT



TOP VIEW



BOTTOM VIEW

RELAY BOARD

3-5

SECTION 4 - PARTS LIST

4-1 IPA SWITCH BOARD - (604-308)

*Not used on ACH Models

LOCATION	DESCRIPTION	PART NUMBER
CAPACITORS		
C101	2-20pF Trim	1517-0000-019
C102	2020pF Trim	1517-0000-019
C103	56pF NPO	1524-0560-002
C104	470pF CD	1523-0471-002
C105	10uF Elec	1513-0100-003
C106	68pF NPO	1524-0680-002
*C107	470pF CD	1523-0471-002
C108	4-60pF Mica Trim	1517-0000-002
C109	68pF Mica	1506-0680-550
*C110	470pF CD	1523-0471-002
*C111	37pF Undwd	1522-0370-002
C112	not used	
*C113	20pF Undwd	1522-0200-006
*C114	470pF CD	1524-0471-002
C115	37pF CD	1523-0471-002
C116	15pF Undwd	1522-0150-002
C117	390pF Undwd	1522-0391-002
C118	150pF Undwd	1523-0151-002
C119	150pF CD	1523-0151-002
C120	.01uF CD	1503-0103-003
RESISTORS		
R101	10 ohm ¼W 5% car film	4704-0100-032
*R102	150 ohm 2W 10% comp	4700-0151-046
R103	220 ohm ¼W 10% comp	4700-0221-042
R104	470 ohm ¼W 10% comp	4700-0471-042
COILS		
L101	choke 3½T	1803-5125-906
L102	choke 1.8 UHY	1803-3268-208
L103	choke 1.8 UHY	1803-3268-208
L104	choke 7½T	1803-5125-913
L105	choke 2½T	1803-5125-901
*L106	choke 1.8 UHY	1803-3268-208
*L107	coil .015 UHY	1801-1252-601
L108	coil .015 UHY	1801-1252-601
L109	coil .015 UHY	1801-1252-601
DIODES		
*CR101	diode, pin	4815-3408-601
*CR102	diode, pin	4815-3408-601
CR103	Sil, 1N4148	4805-1241-200
CR104	not used	
*CR105	diode, pin	4815-3408-601

LOCATION	DESCRIPTION	PART NUMBER
TRANSISTOR		
Q101	RF power, MRF 264	4804-3411-802

4-2 PA BOARD - (700-320)

CAPACITORS		
C201	4-60pF EL404 PC Trim	1517-0000-002
C202	4-60pF EL404 PC Trim	1517-0000-002
C203	47pF 10% 50V Undwd T101 Mica	1522-0470-002
C204	100pF 10% Undwd T101 Mica	1522-0101-002
C205	100pF 10% Undwd T101 Mica	1522-0101-002
C206	150pF 10% Undwd T101 Mica	1522-0151-002
C207	150pF 10% Undwd T101 Mica	1522-0151-002
C208	120pF 10% Undwd T101 Mica	1522-0121-002
C209	120pF 10% Undwd T101 Mica	1522-0121-002
C210	150pF 10% Undwd T101 Mica	1522-0151-002
C211	150pF 10% Undwd T101 Mica	1522-0151-002
C212	390pF 10% Undwd T101 Mica	1522-0391-002
C213	390pF 10% Undwd T101 Mica	1522-0391-002
C214	68pF 10% Undwd T101 Mica	1522-0680-002
C215	68pF 10% Undwd T101 Mica	1522-0680-002
C216	500pF 10% Undwd T101 Mica	1522-0501-002
C217	500pF 10% Undwd T101 Mica	1522-0501-002
C218	.001mF 50V Z5U CD	1503-0102-003
C219	.001mF 50V Z5U CD	1503-0102-003
C220	.1mF 12V +8C-20 CD	1502-0104-006
C221	.1mF 12V +8C-20 CD	1502-0104-006
C222	100mF 16V EL	1513-0101-002
C223	100mF 16V EL	1513-0101-002
C224	4-60pF EL404 PC Trim	1517-0000-002
RESISTORS		
R201	15 ohm 1W 10% comp	4700-0150-045
COILS		
L201	ferroxcube vk 200 19/4B	2502-0000-002
L202	ferroxcube vk 200 10/4B	2502-0000-002
L203	choke .15 UHY BAH-100 302-690	1803-3269-000
L204	choke .15 UHY BAH-100 302-690	1803-3269-000
TRANSISTORS		
Q201	RF Power MRF-245 302-698	4804-3269-801
Q202	RF Power MRF-245 302-698	4804-3269-801

4-3 RELAY BOARD - (504-618)

LOCATION	DESCRIPTION	PART NUMBER
C301	.001mF CD	1503-0102-003
C302	.001mF CD	1503-0102-003
C303	.01mF CD	1503-0103-003
C304	.01mF CD	1503-0103-003
C305	150pF CD	1523-0151-002
C306	150pF CD	1523-0151-002
L301	choke BAH-100 302-964	1803-3269-400
L302	choke BAH-100 302-964	1803-3269-400
CR301	Silicon IN4002	4806-0000-004
RY301	Relay BAH-100 302-691	4500-3269-100

4-4 MAIN CHASSIS

ELECTRICAL COMPONENTS

FTC-1 - FTC-6	.001mF Feedthru	1521-5129-800
J-1	Power Connector	2109-5120-403
J-2	Control Connector	2109-5120-403
J-3	12 VDC Connector	2109-5120-403
	50 ohm Input Conn	2105-0000-020
FS-1	Fuseholder	2100-0000-003
FS-2	25 Amp fuse	5106-0000-012

MECHANICAL COMPONENTS

ACH100CD	Label, ACH100CD	2507-1430-309
AASCH100CD	Label, AASCH100CD	2507-1430-310
	Label, TX output	2507-1419-700
	Label, 12 VDC	2507-1419-800
	Label, Transmit	2507-1419-900
	Label, Control	2507-1520-000
	Feedthru shield	2508-3413-901
	Cover mtg. screw	2808-0250-022
	PCB mtg. screw	2809-0500-005
	Transistor mtg. screw	2823-0312-029
	Pwr shield mtg. screw	2803-0312-001
	Pwr shield mtg. nut	2852-0440-001
	Heatsink	5400-6424-000
	Wire tie	6005-0000-002
	Label, Receive	2507-1420-100